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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/099,982	03/19/2002	Stephen Randolph Winzer	18180.0115	5514

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EXAMINER	
JUBA JR, JOHN	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 07/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/099,982	Applicant(s) WINZER, STEPHEN RANDOLPH
	Examiner John Juba	Art Unit 2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-32 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-32 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 19 March 2002 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

Applicant's I.D.S. filed May 28, 2002 has been fully considered. The sixth citation (B. Blonk, et al) has been lined-through, because the place of publication is not indicated. Unless the information is completed, this citation will not be printed on the first page of any patent issuing from the instant application.

Drawings

The drawings are objected to under 37 CFR 1.83(a) because they fail to show the "ring" as described in the specification (Pg. 6, line 13). Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the *plurality* of electroactive actuator "strips" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. The specification describes Figure 3 as illustrating a plurality of strips of electroactive material (Pg. 11, lines 16 and 17), but it appears that only 1 "strip" (41) is illustrated. A plurality of actuators (39) are identified,

but it is not clear how or why these would be regarded as "strips" as distinguished from the rectangular actuators of Figure 2.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

The use of the trademark Kapton™ has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology. Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

The disclosure is objected to because of the following informalities. Appropriate correction is required:

Numerous reference numbers (*e.g.*, 3, 5, 7, 11, 13, 15, 23, 25, 27, 29) used in the figures are not discussed in the specification. Since the illustration is clearly necessary to the understanding of the invention, the identified structure should be described.

In the text beginning at the bottom of Page 9 and bridging to Pg. 10, it is believed that "six shape-retaining elements" should read "eight shape-retaining elements".

Claim Rejections - 35 USC § 112

Claims 1 – 32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is confusing or incorrect in reciting a plurality of electroactive actuator "strips". In light of the specification (Pg. 11, line 19 through Pg. 12, line 4), electroactive material is described as possibly including a piezoelectric material. There is however, no description of the shape memory alloy as "electroactive" per sé. The structure identified in Figure 3 as a "strip" is a shape memory alloy material (Pg. 13, last paragraph). A plurality of such strips is not described. Thus, the meaning of "strips" is ambiguous, and it is not clear whether claim 1 refers to a plurality of "strips" (41) or to a plurality of "actuators" 39. Similarly, it is not clear whether the reference to the "actuators" as strips is at all correct. Claims 2 – 32 inherit the same deficiency through their dependency from claim 1.

Claims 3 and 10 clearly rely upon the recitation of the trademark Kapton™ to define the material of the unitary body or mirror blank material. It has been held that if the trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of the 35 U.S.C. 112, second paragraph. *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. The formula or characteristics of the product may change from time to time and yet it may continue to be sold under the

same trademark. In patent specifications, every element or ingredient of the product should be set forth in positive, exact, intelligible language, so that there will be no uncertainty as to what is meant. Arbitrary trademarks which are liable to mean different things at the pleasure of manufacturers do not constitute such language. *Ex Parte Kattwinkle*, 12 USPQ 11 (Bd. App. 1931).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 – 4, 6 – 15, 19 – 22, 24, 27, and 29 – 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson,et al (U.S. Patent number 3,599,218), in view of Elliot, et al, and further in view of Maclean, et al. Noting the disclosed use of their structure as a mirror ("optical reflector"; Col. 5, lines 70 – 75), Williamson, et al disclose a light-weight mirror comprising

a "first" layer, for example the rear closure of the mirror hub (24), which inherently has first and second sides;

a second layer (14) having front and back sides, a reflective layer being on the front side;

a plurality of stiffening elements (16) interconnected with the second layer to stiffen the mirror; and

a plurality of shape retaining elements (52) (56) attached to the second layer and operable to deploy the mirror and to bias the mirror in a desired position.

Thus, Williamson, et al disclose the broad invention, namely a deployable mirror. However, Williamson, et al do not disclose a plurality of electroactive actuators arranged between the first and second layers and operable to alter the mirror curvature, or electrical connectors cooperating with the actuators.

In the same field of endeavor, Elliot, et al disclose a deployed reflector (18) having a surface (Col. 6, lines 1-2) and a plurality of stiffening elements (80). Elliot, et al teach that reflectors deployed in space are subject to distortion thermal factors, deployment tolerances, and other sources (Col. 1, lines 9 – 16). In order to maintain the reflector surface in the desired form, Elliot, et al teach provision of a reflector figure sensing unit, and a plurality of actuators cooperating to reshape the reflector structure. As shown in Figure 5B, the actuators reshape the "second" reflector layer with respect to a "first" layer (bottom-most in the figure).

It would have been obvious to one of ordinary skill to employ a figure sensing unit and plurality of actuators in the mirror of Williamson, et al, in the interest of assuring that the mirror maintains its desired form, despite thermal or other influences, as suggested by Elliot, et al. Thus, Williamson, et al and Elliot, et al disclose the invention substantially as claimed. However, these references do not particularly disclose the actuators as being "electroactive" as recited.

In the same field of endeavor, Maclean, et al disclose a plurality of actuators "shape memory tendons" and expressly teach that they would be well-suited for use in adaptive antenna reflectors for phasing and balancing thermal distortions (Col. 2, lines 13 –22). Insofar as the actuators respond to an electric current flowing therethrough (to undergo deformation) to serve as actuators, the shape memory tendons of Maclean, et al fairly comprehend "electroactive actuator strips" within the specificity recited.

It would have been obvious to one of ordinary skill to employ the electroactive actuator strips of Maclean, et al in the adaptive reflector of Williamson, et al and Elliot, et al in the interest of providing a means to adaptively balance thermal loads, as suggested by Maclean, et al. It is believed that, insofar as the actuators of Maclean, et al are electrically operated, electrical "connectors", at least in the form of wires or stripline conductors, inhere in the teaching of Maclean.

With regard to claims 2, 3, 9, and 10, Williamson, et al teach Kapton™ as being well-suited for the layer and supporting structure ("beams" and "torus") of a reflector to be deployed from a spacecraft. Thus, with regard to claims 2 and 3, it appears that one of ordinary skill would have found it obvious to employ Kapton™ for the other support structures, such as the first layer, as recited.

With regard to claim 4, one of ordinary skill would have appreciated that in order for the combined structure to remain deployable, the first layer would have to have been of a construction similar to the "second" layer. Accordingly, just as the "second" layer was recognized as requiring stiffeners, one of ordinary skill would have found it obvious to employ stiffeners in the first layer, as recited.

With regard to claims 7, 8, 11, 12, 19, and 20 and 12, Williamson, et al, Elliot, et al, and Maclean, et al disclose the invention substantially as claimed, but do not disclose the recited material thicknesses. Nonetheless, Williamson, et al teach storing an elastic restoring force within the film layer. Thus, since the restorative force is a function of the film thickness, it appears that one of ordinary skill would have arrived at the recited film thickness through only routine experimentation to discover a workable range.

With regard to claim 14 and 15, the electroactive actuators of Maclean, et al are a NiTi shape memory alloy operative as shape retaining elements. With particular regard to claim 15, the examiner takes Official notice of the fact that NiTiNOL is a known material recognized as suitable for use as a shape memory alloy. Thus, it appears that selection of this material would have been a rather obvious matter of selecting a material based upon its known suitability for the intended use.

With regard to claims 21, 22, and 24, Elliot, et al teach real-time adaptation in response to thermal distortion, Maclean, et al teach compensating for thermal distortion, and teach phasing. It is believed that any vibration in the structure would have been an obvious form of one of the influences alluded to by Elliot, et al.

With regard to claims 29 and 30, the prior art does not expressly disclose the recited volume density. However, since the prior art teaches the use of an ultra-lightweight polymer partially filled with air and partially defining a vacuum between the elements, it is believed that the prior art structure inherently has the recited volume

density. If such is not the case, then Applicant should demonstrate that this feature is not inherent. *In re Swinehart,* 169 USPQ 226 (CCPA 1971).

Claims 1 – 4, 6 – 13, 16 – 22, 24 – 27, and 29 - 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson,et al (U.S. Patent number 3,599,218), in view of Elliot, et al, and further in view of Melzer, et al (U.S. Patent Appl. Pub. 2002/0048096 A1). Noting the disclosed use of their structure as a mirror ("optical reflector"; Col. 5, lines 70 – 75), Williamson, et al disclose a light-weight mirror comprising

a "first" layer, for example the rear closure of the mirror hub (24), which inherently has first and second sides;

a second layer (14) having front and back sides, a reflective layer being on the front side;

a plurality of stiffening elements (16) interconnected with the second layer to stiffen the mirror; and

a plurality of shape retaining elements (52) (56) attached to the second layer and operable to deploy the mirror and to bias the mirror in a desired position.

Thus, Williamson, et al disclose the broad invention, namely a deployable mirror. However, Williamson, et al do not disclose a plurality of electroactive actuators arranged between the first and second layers and operable to alter the mirror curvature, or electrical connectors cooperating with the actuators.

In the same field of endeavor, Elliot, et al disclose a deployed reflector (18) having a surface (Col. 6, lines 1-2) and a plurality of stiffening elements (80). Elliot, et al teach that reflectors deployed in space are subject to distortion thermal factors, deployment tolerances, and other sources (Col. 1, lines 9 – 16). In order to maintain the reflector surface in the desired form, Elliot, et al teach provision of a reflector figure sensing unit, and a plurality of actuators cooperating to reshape the reflector structure. As shown in Figure 5B, the actuators reshape the "second" reflector layer with respect to a "first" layer (bottom-most in the figure).

It would have been obvious to one of ordinary skill to employ a figure sensing unit and plurality of actuators in the mirror of Williamson, et al, in the interest of assuring that the mirror maintains its desired form, despite thermal or other influences, as suggested by Elliot, et al. Thus, Williamson, et al and Elliot, et al disclose the invention substantially as claimed. However, these references do not particularly disclose the actuators as being "electroactive" as recited.

In the same field of endeavor, Melzer, et al disclose a plurality of actuators (3) expressly teach that they would be well-suited for use in adaptive reflectors for damping vibrations and correcting distortion. It will be appreciated that the piezoelectric are "electroactive actuator strips" within the specificity recited.

It would have been obvious to one of ordinary skill to employ the electroactive actuator strips of Melzer, et al in the adaptive reflector of Williamson, et al and Elliot, et al in the interest of providing a means to adaptively correct for distortion, as suggested by Melzer, et al. It is believed that, insofar as the actuators of Melzer, et al are

electrically operated, electrical "connectors", at least in the form of wires or stripline conductors, inhere in the teaching of Maclean.

With regard to claims 2, 3, 9, and 10, Williamson, et al teach Kapton™ as being well-suited for the layer and supporting structure ("beams" and "torus") of a reflector to be deployed from a spacecraft. Thus, with regard to claims 2 and 3, it appears that one of ordinary skill would have found it obvious to employ Kapton™ for the other support structures, such as the first layer, as recited.

With regard to claim 4, one of ordinary skill would have appreciated that in order for the combined structure to remain deployable, the first layer would have to have been of a construction similar to the "second" layer. Accordingly, just as the "second" layer was recognized as requiring stiffeners, one of ordinary skill would have found it obvious to employ stiffeners in the first layer, as recited.

With regard to claims 7, 8, 11, 12, 19, and 20 and 12, Williamson, et al, Elliot, et al, and Melzer, et al disclose the invention substantially as claimed, but do not disclose the recited material thicknesses. Nonetheless, Williamson, et al teach storing an elastic restoring force within the film layer. Thus, since the restorative force is a function of the film thickness, it appears that one of ordinary skill would have arrived at the recited film thickness through only routine experimentation to discover a workable range.

With regard to claims 16 – 18, the prior art does not expressly disclose the recited arrangement of contact pads or the use of copper electrodes. Nonetheless, it is believed that, given the mode of operation of the actuators of Melzer, et al, the requisite arrangement of contact pads and electrodes would have been readily apparent.

Further, the examiner takes Official notice of the fact that copper was well-known for its suitability as a conductor. Thus, it appears that one of ordinary skill would have found it obvious to use copper, since such would have required nothing more than selecting a known material based upon its suitability for the intended use.

With regard to claims 21, 22, and 24, Elliot, et al teach real-time adaptation in response to thermal distortion, Melzer, et al teach compensating for vibration and the effects of gravity. It is believed that any vibration in the structure would have been an obvious form of one of the influences alluded to by Elliot, et al.

With regard to claims 29 and 30, the prior art does not expressly disclose the recited volume density. However, since the prior art teaches the use of an ultra-lightweight polymer partially filled with air and partially defining a vacuum between the elements, it is believed that the prior art structure inherently has the recited volume density. If such is not the case, then Applicant should demonstrate that this feature is not inherent. *In re Swinehart,* 169 USPQ 226 (CCPA 1971).

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson,et al, in view of Elliot, et al and Maclean, et al, and further in view of Lach, et al. As set forth above for claim 1, Williamson, et al, Elliot, et al, and Maclean, et al suggest the invention substantially as claimed. However, these references do not disclose carbon fiber stiffeners, as recited. Nonetheless, it has been held that the use of a known material based upon its known suitability for a particular application, does not represent a patentable advance.

In the same field of endeavor, Lach, et al disclose a reflector structure comprising a reflectively coated Kapton™ layer and a network of stiffeners. Lach, et al suggest carbon fibers as suitable stiffeners for the Kapton™ reflector (Col. 2, lines 52 – 53; Col. 4, lines 55 – 60).

It would have been obvious to one of ordinary skill to employ carbon fiber stiffeners in the reflector of Williamson, et al, Elliot, et al, and Maclean, et al, in the interest of providing lightweight and resilient support to the Kapton™ reflective layer, as expressly taught by Lach, et al.

Claims 23 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson,et al, in view of Elliot, et al, and Maclean, et al, and further in view of Plante, et al and Hardy (the latter being incorporated by reference into the former). As set forth above for claims 1 and 21, Williamson, et al, Elliot, et al, and Maclean, et al disclose the invention substantially as claimed. However these references do not disclose correcting for atmospheric aberration or use of a wavefront sensor.

In the same field of endeavor, Plante, et al a deformable reflector having two layers and a plurality of electroactive actuators. Plante, et al teach that deformable reflectors are useful in a variety of space-based applications. One particularly useful aspect of deformable reflectors, in addition to permitting correction for thermally-induced distortion, is the ability to correct for image distortion arising from atmospheric turbulence (Col. 1, lines12 – 40). It order to overcome this, Plante, et al teach use of a

wavefront sensing system (such as that of Hardy; Col. 5, line 9) in combination with a feedback loop to control the electroactive actuators.

It would have been obvious to one of ordinary skill to employ a wavefront sensor and feedback loop in the reflector of Williamson, et al, Elliot, et al, and Maclean, et al, in the interest of permitting images to be obtained which are free from aberration due to atmospheric turbulence. That is, in light of Plante, et al and Hardy, one of ordinary skill would have appreciated that the active optical reflector of Williamson, et al, Elliot, et al, and Maclean, et al would have been suitable for use in an imaging system, and that the adaptive optical system could be corrected for atmospheric turbulence, by virtue of the electroactive actuators, if provided with a wavefront sensing system, as taught by Plante, et al and Hardy.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson,et al, in view of Elliot, et al and Melzer, et al, and further in view of Lach, et al. As set forth above for claim 1, Williamson, et al, Elliot, et al, and Melzer, et al suggest the invention substantially as claimed. However, these references do not disclose carbon fiber stiffeners, as recited. Nonetheless, it has been held that the use of a known material based upon its known suitability for a particular application, does not represent a patentable advance.

In the same field of endeavor, Lach, et al disclose a reflector structure comprising a reflectively coated Kapton™ layer and a network of stiffeners. Lach, et al suggest

carbon fibers as suitable stiffeners for the Kapton™ reflector (Col. 2, lines 52 – 53; Col. 4, lines 55 – 60).

It would have been obvious to one of ordinary skill to employ carbon fiber stiffeners in the reflector of Williamson, et al, Elliot, et al, and Melzer, et al, in the interest of providing lightweight and resilient support to the Kapton™ reflective layer, as expressly taught by Lach, et al.

Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson,et al; in view of Elliot, et al and Melzer, et al, and further in view of Maclean, et al. As set forth above for claim 1, Williamson, et al, Elliot, et al, and Melzer, et al suggest the invention substantially as claimed. However, these references do not disclose a shape retaining members comprising a shape memory alloy.

In the same field of endeavor, Maclean, et al disclose a plurality of actuators "shape memory tendons" and expressly teach that they would be well-suited for use in adaptive antenna reflectors for phasing and balancing thermal distortions (Col. 2, lines 13 –22), and thus teach use of a shape memory alloy as shape retaining members.

It would have been obvious to one of ordinary skill to employ the shape retaining members of Maclean, et al in the adaptive reflector of Williamson, et al, Elliot, et al, and Melzer, et al, in the interest of providing a further means to adaptively balance thermal loads, as suggested by Maclean, et al.

Claims 23 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Williamson,et al, in view of Elliot, et al, and Melzer, et al, and further in view of Plante, et al and Hardy (the latter being incorporated by reference into the former). As set forth above for claims 1 and 21, Williamson, et al, Elliot, et al, and Melzer, et al disclose the invention substantially as claimed. However these references do not disclose correcting for atmospheric aberration or use of a wavefront sensor.

In the same field of endeavor, Plante, et al a deformable reflector having two layers and a plurality of electroactive actuators. Plante, et al teach that deformable reflectors are useful in a variety of space-based applications. One particularly useful aspect of deformable reflectors, in addition to permitting correction for thermally-induced distortion, is the ability to correct for image distortion arising from atmospheric turbulence (Col. 1, lines12 – 40). It order to overcome this, Plante, et al teach use of a wavefront sensing system (such as that of Hardy; Col. 5, line 9) in combination with a feedback loop to control the electroactive actuators.

It would have been obvious to one of ordinary skill to employ a wavefront sensor and feedback loop in the reflector of Williamson, et al, Elliot, et al, and Melzer, et al, in the interest of permitting images to be obtained which are free from aberration due to atmospheric turbulence. That is, in light of Plante, et al and Hardy, one of ordinary skill would have appreciated that the active optical reflector of Williamson, et al, Elliot, et al, and Melzer, et al would have been suitable for use in an imaging system, and that the adaptive optical system could be corrected for atmospheric turbulence, by virtue of the

electroactive actuators, if provided with a wavefront sensing system, as taught by Plante, et al and Hardy.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Carreras, et al disclose a deployable mirror and suggest use of a shape memory alloy to apply a shape retaining force to the mirror.

Allen, et al disclose a space deployable reflector having stiffeners/shape retainers that facilitate deployment, and recognize the development of deployable light reflectors and the development of deployable radio frequency reflectors as being in the same field of endeavor.

Shen disclose a two-layer deformable mirror structure employing actuators.

Shimodaira, et al disclose a multilayered mirror support structure.

Stang disclose a mirror comprising two layers and shape retaining elements therebetween.

Perkins, et al disclose a deformable mirror having first and second layers.

DIEHL GMBH & CO (DE 4206792 A1) disclose a deformable mirror with a electroactive actuator. A mirror retaining collar made of shape memory alloy can be cooled for release and replacement of the mirror element. Subsequent heating of the collar securely seizes the mirror element.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (703) 308-4812. The examiner can normally be reached on Mon.-Fri. 9 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Drew Dunn can be reached on Mon.- Thu., 9 - 5. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JOHN JUBA
PRIMARY EXAMINER
Art Unit 2872

July 21,2003